

IN THE CLAIMS:

1. (Currently Amended) A system comprising:
 2. at least one first conductive element and at least one second conductive element so disposed with respect to each other that, when the first and second conductive elements extend through a dielectric mismatch boundary, a first electromagnetic signal will induce a second electromagnetic signal to propagate along the second conductive element;
 3. a transmitter conductively coupled to at least one said first conductive element without also being conductively coupled to any said second conductive element, the transmitter being operable to drive the a first electromagnetic signal along the at least one first conductive element without also driving the at least one second conductive element;
 4. a receiver for receiving the second electromagnetic signals from the at least one second conductive element, the second electromagnetic signal being coupled to the at least one second conductive element in response to the at least one dielectric mismatch boundary;
 5. and
 6. a coupler, mounted for so sliding through a range of positions with respect to the first and second conductive elements as to respond to the first electromagnetic signal by launching on the second conductive element a second electromagnetic signal received by the receiver with a timing with respect to the first electromagnetic signal that depends on the coupler's position; and
 7. positioned at the dielectric mismatch boundary for coupling the second electromagnetic signal, the size of the second electromagnetic signal being independent of dielectric properties associated with substances forming the dielectric mismatch boundary, wherein the coupler exhibits a length corresponding to at least one quarter of a propagation velocity pulse length of the first electromagnetic signal a processing element responsive to the second electromagnetic signal to generate, at least in part from the second magnetic signal's time delay with respect to the first electromagnetic signal, an output indicative of the value of a quantity on which the coupler's location depends.

- 1 2. (Previously Presented) The system of claim 1 further comprising a third conductive
- 2 element surrounding at least part of the at least one first and second conductive elements and
- 3 being connected to a ground plane.
- 1 4. (Currently Amended) The system method of claim 1-23 wherein the at least one
- 2 dielectric mismatch boundary corresponds to a region associated with an interface between at
- 3 least one first substance having a first dielectric constant and at least one second substance
- 4 having a second dielectric constant.
- 1 5. (Previously Presented) The system of claim 1 wherein at least one of the first and second
- 2 electromagnetic signals exhibits an ultra-wideband frequency.
- 1 6. (Currently Amended) The system method of claim 234 wherein the at least one dielectric
- 2 mismatch boundary corresponds to a transitional region between a gaseous substance and a
- 3 liquid substance.
- 1 7. (Currently Amended) The system method of claim 234 wherein the at least one dielectric
- 2 mismatch boundary corresponds to a transitional region between at least two of a vacuum, a
- 3 gaseous substance, a liquid substance, a semi-solid substance, and a solid substance.
- 1 8-12. (Canceled)

- 1 13. (Currently Amended) The system method of claim 11-23 wherein the level corresponds
2 to a volume of dielectric mismatch boundary's position is determined by a fluid's level in a
3 in at least one of an above-ground storage tank and a below-ground storage tank.
- 1 14. (Canceled).
- 1 15. (Currently Amended) The system of claim 1 wherein the at least one of the first and
2 second conductive elements are is flexible.
- 1 16. (Currently Amended) The system of claim 1 wherein the at least one first and second
2 conductive elements exhibit quadrilateral cross-sections.
- 1 17. (Currently Amended) The system of claim 1 wherein the at least one first and second
2 conductive elements exhibit substantially identical cross-sections.
- 1 18. (Canceled)
- 1 19. (Previously Presented) The system of claim 1 wherein the coupler operates as an
2 electromagnetic shunt path between the at least one first and second conductive elements.
- 1 20. (Canceled)
- 1 21. (Currently Amended) The system of claim 1 further comprising:
2 a float for positioning the coupler relative to the at least one dielectric mismatch
3 boundary.
- 1 22. (Previously Presented) The system of claim 21 wherein the float includes a buoyant
2 component and a weighted component.

1 23. (Currently Amended) A method comprising:

2 driving a first electromagnetic signal on an at least one first conductive element by
3 conductive coupling thereto without also driving an at least one second conductive element
4 by conductive coupling, the first conductive element and second conductive element axially
5 separated and so disposed with respect to each other that, when a first electromagnetic signal
6 propagates along the first conductive element and the first and second conductive elements
7 extend through at least one dielectric mismatch boundary, the first electromagnetic signal
8 will induce a second electromagnetic signal to propagate along the second conductive
9 element;

10 receiving, by conductive coupling from the at least one second conductive element,
11 the second electromagnetic signal induced by the first electromagnetic signal driven along
12 the at least one first conductive element, the second electromagnetic signal being coupled to
13 the at least one second conductive element in response to the at least one dielectric mismatch
14 boundary; and

15 determining the value of a quantity on which the dielectric mismatch boundary's
16 location depends at least in part by evaluating a time delay of the second electromagnetic
17 signal relative to the first electromagnetic signal; and
18 generating an output indicative of the quantity's value thus determined to determine
19 a level of the substance.

1 24-26. (Canceled)

1 27. (Previously presented) The method of claim 23 wherein the at least one first and second
2 conductive elements are flexible.

1 28. (Canceled)

1 29. (Currently Amended) The method of claim 28-47 further comprising:

2 providing a float for positioning the coupler relative to the at least one dielectric
3 mismatch boundary.

1 30. (Currently Amended) A method comprising:

2 providing a coupler, mounted for so sliding through a range of positions with respect
3 to first and second conductive elements as to respond to a first electromagnetic signal
4 propagating along the first conductive element by launching on the second conductive
5 element a second electromagnetic signal whose timing with respect to the first
6 electromagnetic signal depends on the coupler's position;

7 driving a first electromagnetic signal by conductive coupling on an at least one the
8 first conductive element without also driving an at least one the second conductive element
9 by conductive coupling, the first conductive element and second conductive element so
10 disposed with respect to each other that, when the first and second conductive elements
11 extend through at least one dielectric mismatch boundary, a first electromagnetic signal will
12 induce a second electromagnetic signal to propagate along the second conductive element;

13 receiving, from the at least one second conductive element; a the second
14 electromagnetic signal induced by the first electromagnetic signal driven along the at least
15 one first conductive element thereby launched on the second conductive element; the second
16 electromagnetic signal being coupled to the at least one second conductive element in
17 response to the at least one dielectric mismatch boundary; and

18 providing a coupler determining the value of a quantity on which the coupler's
19 position depends at least in part by evaluating a time delay of the second electromagnetic
20 signal relative to the first electromagnetic signal; and

21 generating an output signal dependent upon the quantity's value thus determined
22 exhibiting a length corresponding to at least one-quarter of a propagation velocity pulse
23 length of the first electromagnetic signal, the coupler positioned at the dielectric mismatch
24 boundary for coupling the second electromagnetic signal to the at least one second
25 conductive element, the size of the second electromagnetic signal being independent of

26 dielectric properties associated with substances forming the at least one dielectric mismatch
27 boundary.

1 31. (Currently Amended) A system comprising:

2 a first conductive element and a second conductive element, axially separated and so
3 disposed with respect to each other that, when a first electromagnetic signal is propagating
4 along the first conductive element and the first and second conductive elements extend
5 through a dielectric mismatch boundary, a the first electromagnetic signal will induce a
6 second electromagnetic signal to propagate along the second conductive element;

7 a transmitter operable to drive by conductive coupling the first electromagnetic
8 signal along the at least one first conductive element without also driving the at least one
9 second conductive element being conductively coupled to the second conductive element;

10 a receiver for receiving the second electromagnetic signal from the at least one
11 second conductive element, the received electromagnetic signal being coupled to the at least
12 one second conductive element in response to the at least one dielectric mismatch boundary;
13 and

14 a processor for evaluating a time delay of the second electromagnetic signal relative
15 to the first electromagnetic signal to determine a level of the substance the value of a
16 quantity on which the mismatch boundary's location depends and generating an output
17 representative of that quantity's value.

1 32. (Canceled)

1 33. (Currently Amended) The system of claim 32-31 wherein the first electromagnetic
2 signal exhibits an ultra-wideband frequency.

1 34-36. (Canceled)

- 1 37. (Currently Amended) The system of claim 32-31 wherein the first and second
2 conductive elements are flexible.
- 1 38. (Currently Amended) The system of claim 32-31 wherein the first and second
2 conductive elements exhibit quadrilateral cross-sections.
- 1 39. (Currently Amended) The system of claim 32-31 wherein the first and second
2 conductive elements exhibit substantially identical cross-sections.
- 1 40. (Currently Amended) The system of claim 32-31 wherein the distance determined by
2 the processorquantity whose value the output represents corresponds to a dimension
3 associated with an object.
- 1 41. (Currently Amended) The system of claim 32-31 wherein the quantity whose value the
2 output representsdistance determined by the processor corresponds to a displacement
3 between a plurality of objects.
- 1 42. (Currently Amended) The system of claim 32-31 wherein the quantity whose value the
2 output representsdistance determined by the processor corresponds to an angular orientation.
- 1 43. (Currently Amended) The system of claim 32-31 wherein the quantity whose value the
2 output representsdistance determined by the processor corresponds to a degree of pressure.
- 1 44. (Canceled)
- 1 45. (Currently Amended) The system of claim [[44]] 1 further comprising a supporting
2 material for slidably receiving the coupler in a channel defined therein, the supporting
3 material maintaining a consistent displacement between the coupler and the first and second
4 conductive elements.

1 46. (Currently Amended) The system according to claim 32,31 wherein the first
2 electromagnetic signal propagates from a first end of the first conductive element toward a
3 second end of the first conductive element, and the propagation of the first electromagnetic
4 signal through the boundary will induce the second electromagnetic signal to propagate
5 along the second conductive element toward a first end of the second conductive element.

1 47. (Currently Amended) A method as defined in claim 30 of measuring distances, the
2 method comprising:
3 — driving a first electromagnetic signal along a first conductive element without also
4 driving a second conductive element, where the first and second conductive elements are so
5 disposed with respect to each other that, when the first and second conductive elements
6 extend through a dielectric mismatch boundary, a first electromagnetic signal will induce a
7 second electromagnetic signal to propagate along the second conductive element;
8 — receiving the second electromagnetic signal;
9 — providing a coupler positioned at the dielectric mismatch boundary for coupling the
10 second electromagnetic signal, the size of the received second electromagnetic signal being
11 independent of dielectric properties associated with substances forming the dielectric
12 mismatch boundary, wherein the coupler exhibits a length corresponding to at least one-
13 quarter of a propagation propagation velocity pulse length of the first electromagnetic
14 signal; and
15 — determining, at least in part from a time delay between the first and second
16 electromagnetic signals, a distance associated with the dielectric mismatch boundary.

1 48. (Currently Amended) The method of claim 47-30 wherein the distance corresponds to a
2 dimension associated with an object.

1 49. (Currently Amended) The method of claim 47-30 wherein the distance corresponds to a
2 displacement between a plurality of objects.

- 1 50. (Currently Amended) The method of claim 47-30 wherein the distance corresponds to
2 an angular orientation.
- 1 51. (Currently Amended) The method of claim 47-30 wherein the distance corresponds to a
2 degree of pressure.
- 1 52. (Currently Amended) The method according to claim 4730, wherein the coupler so
2 couples the first and second conductive elements as to launch the second electromagnetic
3 signal along the second conductive element when the first electromagnetic signal reaches the
4 position of the coupler, and wherein the coupler is slidable along the first and second
5 conductive elements.
- 1 53. (Currently Amended) The method according to claim 4730, wherein the first
2 electromagnetic signal propagates from a first end of the first conductive element toward a
3 second end of the first conductive element, and the propagation of the first electromagnetic
4 signal through the boundary will induce the second electromagnetic signal to propagate
5 along the second conductive element toward a first end of the second conductive element.
- 1 54. (New) The system of claim 1 wherein the quantity whose value the output represents is
2 the level of a fluid.
- 1 55. (New) The method of claim 23 wherein least one said first conductive element is
2 positioned substantially parallel to at least one said second conductive element and
3 perpendicular to the dielectric mismatch boundary.
- 1 56. (New) The method of claim 23 wherein the quantity whose value the output represents
2 is the level of a fluid.

- 1 57. (New) The system of claim 31 wherein least one said first conductive element is
- 2 positioned substantially parallel to at least one said second conductive element.

- 1 58. (New) The system of claim 31 wherein the quantity whose value the output represents
- 2 is the level of a fluid.

- 1 59. (New) The method of claim 30 wherein least one said first conductive element is
- 2 positioned substantially parallel to at least one said second conductive element.

- 1 60. (New) The method of claim 30 wherein the coupler's location is determined by the
- 2 level of a fluid.

- 1 61. (New) The method of claim 30 wherein at least of the conductive elements is flexible.

- 1 62. (New) The method of claim 30 wherein the coupler operates as an electromagnetic
- 2 shunt path between at least one said first conductive element and at least one said second
- 3 conductive element.

- 1 63. (New) The method of claim 30 wherein the quantity whose value the output represents
- 2 is the level of a fluid.